

THE EFFECTS OF LONG DURATION HEAD DOWN TILT BED REST ON NEUROCOGNITIVE PERFORMANCE: THE EFFECTS OF EXERCISE INTERVENTIONS

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Abstract

We are conducting ongoing experiments in which we are performing structural and functional magnetic resonance brain imaging to identify the relationships between changes in neurocognitive function and neural structural alterations following a six month International Space Station mission and following 70 days exposure to a spaceflight analog, head down tilt bedrest. Our central hypothesis is that measures of brain structure, function, and network integrity will change from pre to post intervention (spaceflight, bedrest). Moreover, we predict that these changes will correlate with indices of cognitive, sensory, and motor function in a neuroanatomically selective fashion. Our interdisciplinary approach utilizes cutting edge neuroimaging techniques and a broad ranging battery of sensory, motor, and cognitive assessments that will be conducted pre flight, during flight, and post flight to investigate potential neuroplastic and maladaptive brain changes in crewmembers following long-duration spaceflight. Success in this endeavor would 1) result in identification of the underlying neural mechanisms and operational risks of spaceflight-induced changes in behavior, and 2) identify whether a return to normative behavioral function following re-adaptation to Earth's gravitational environment is associated with a restitution of brain structure and function or instead is supported by substitution with compensatory brain processes. Our ongoing bed rest participants are also engaging in exercise studies directed by Dr. Lori Ploutz Snyder. In this presentation, I will briefly highlight the existing literature linking exercise and fitness to brain and behavioral functions. I will also overview the metrics from my study that could be investigated in relation to the exercise and control subgroups.

This work is supported by the National Space Biomedical Research Institute through NASA NCC 9-58 and by NASA grant # NNX11AR02G.